INSTALLING INSTRUCTIONS FOR THE FISCHER "SW-12" INTERMEDIATE

SHORT WAVE HIGH FREQUENCY APPARATUS

The installation and mechanical operation of this unit are very simple. Only one dial designated as "Patient's Control", a 5-point "Volume Control" switch and four patients outlets are employed to regulate the amount of current delivered.

Two "OFF" and "ON" switches, one for filament circuit, the other for plate circuit, and the "Volume Control" complete the mechanical features of the control panel. There is a receptacle on side of cabinet for plugging in foot switch, and another, for line current contact.

Installation of rectifying and power tubes is the only item to consider in the assembly of this unit.

First: Remove rear panel of cabinet.

Next, carefully unpack each tube and insert in sockets. Insert larger power tubes into sockets on lower shelf, pressing firmly while you rotate same clockwise until metal pins have slipped into slots in socket. Place spring clips (on copper leads) on metal cap on top of tubes.

Smaller (rectifier) tubes go into sockets in upper right hand corner (rear). Place loop end of connection over metal cap on top of tube.

REPLACE REAR PANEL

CAUTION: When Mercury Rectifier tubes are first installed it is necessary to leave the filaments lighted for 15 minutes before turning on the plate current. This will deposit all mercury in the base removing it from parts where it has been shaken in transit. It is not necessary to repeat this caution except after shipping.

Plug in your "line current" connecting cord and turn filament current switch to "ON", which delivers current to the rectifying tubes. Always turn on this switch first and give these tubes a few seconds to heat up before turning plate current switch "ON". If you observe this rule it will prolong the life of these tubes. If all tubes light up when filament switch is "ON" you are ready to apply electrodes and give a treatment. See that plate current switch is "OFF" when plugging treatment cords into "Patient's Current" outlets on unit, or otherwise you may burn your fingers.

CAUTION:

If line supplying current to this machine is excessively high; i.e., over 115 volts, and the output of the machine apparently is overstrong proceed as follows:

Just inside the back panel (near the bottom) you will find a small bakelite strip with 3 studs, also a brass connecting link from the center stud to the left side

which is marked 110. Remove hexagon nut and place this link over the center stud and the stud to the right, which is marked 120. This will throw a lesser load into the transformer and the machine will work more satisfactorily from a high voltage line.

Short wave high frequency machines were developed to permit the use of low voltage capacity electrodes. The use of capacity electrodes simplifies treatment technic.

The use of low voltage capacity electrodes demands higher frequencies than those employed when conduction (diathermy) electrodes were used.

The transformation of 60 cycle power into short wave current is accomplished in two steps or stages by the following construction units:

1. Power transformer.
2. High frequency power oscillator.

POWER TRANSFORMER

The power transformer raises the line voltage to proper potential. A 5-point "Volume Control" switch in series with the primary of the transformer serves to vary the output. For treatments not requiring a large amount of current, this switch may be set to point 1 or 2, or power may be increased to point 5 as desired.

RECTIFYING SYSTEM

The secondary voltage of the power transformer is rectified by means of 2 rectifier tubes, thus supplying the power oscillator with unidirectional current voltage. It is recommended, for the longest life and most efficient operation of such tubes, that the filament of the tubes (after shipment or any rough handling) be heated for 15 minutes before the power voltage is applied. This permits the mercury which has spread over the inner surface of the glass and elements to vaporize and settle in the base of the bulb. The manufacturer further recommends that before each treatment the filaments be heated for a few seconds before power voltage is applied.

POWER OSCILLATOR

The power oscillator consists of a tuned-plate-tuned-grid circuit employing two power tubes. A special form of inductance coupling is used for coupling the patient's circuit with the plate oscillating circuit. Current is measured by a single scale meter.

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OPERATING INSTRUCTIONS FOR THE FISCHER ULTRA SHORT WAVE HIGH FREQUENCY APPARATUS

CONDENSER PAD ELECTRODES

The short wave electrodes are made of a woven metal center, covered with flexible rubber.

Additional padding to increase the depth of heat production are generally used. Turkish towels or Terry cloth serve very well.

There should be no metal nor rayon clothing between the electrode and the skin.

Guard against the possibility of the accumulation of pools of moisture, as perspiration between the patient and electrodes will cause prickling, hot spots and if not corrected, blisters. Never disregard the patient's complaint regarding hot spots. These can occur and should be guarded against by proper padding.

One or more active electrodes may be used simultaneously with a general indifferent electrode and a multiple binding post (Catalog No. 866) as a convenience in attaching to the outlet on the machine proper.

When pad type electrodes are used, they are generally placed on as nearly opposite sides of the part to be treated as possible.

When the cuff or belt types of electrodes are used, they are placed around the limb (or the trunk) above and below the area to be heated. These cuffs should have an area considerably larger than the cross section of the part to be treated.

About the same principles of obtaining a concentration of heat may be followed in applying the condensor electrodes and the short wave currents as is followed with the metal plate electrodes and ordinary diathermy except that with short wave currents it is not necessary to be so exacting.

The indications for short wave seem to be those conditions in which heat for one reason or another would be indicated. The effects of heat, from the viewpoint of increasing the circulation in a given part and/or its effect upon the chemical changes that go on in the body, and the resulting benefits that are derived from these effects, are of tremendous value and do closely approximate nature's own method of combating diseases. The opinion of the best informed men whom we have consulted is that where heat is indicated there is some relation between the value of the application and the rise in temperature of the part desired to be treated, insofar as the application is kept within the patient's tolerance; at least, perhaps within the temperature of about 104 or 104.2 at which the blood supply appears to reach its maximum.

Undoubtedly a great deal of the confusion about the effect of the application of short wave has been occasioned by a lack of understanding of the electrical principles involved, in order to actually get the desired rise in temperature in the part desired to be treated. We must consider that the body is heated up by an actual passage of current, and it is the heat generated by the current on account of its passage through the body that is of value. Short wave unquestionably heats up insulated or isolated conductive portions to a greater

extent than does diathermy, and consequently affords a more even distribution of the heat on account of the greater number of avenues of heat production.

A further consideration in the application of short wave is, that the portion of the body immediately near the surface and underneath the electrode receives the greatest density of the current; thereby giving a tendency to heat up this portion somewhat excessively. So many nerve endings being located near the surface gives the patient a decided sensation of heat, even though the depths of that portion will be actually raised in temperature very slightly.

In considering the application of short wave with pads, wherein the area of entry of current into the body is less than the cross section of the part that is desired to be heated up, it is reasonable to assume that the current entering the body is at its greatest density in that portion immediately near the surface of the skin, and the heat generated there is greatest, thus giving the patient a great sensation of heat. As the current leaves the area immediately underneath the pad it spreads out more or less in all directions, seeking the path of least resistance through the body. As the current density in a particularly conductive area rises it causes current to seek out the somewhat less conductive areas to pass through. This gives us a very rapidly decreasing current density as the current leaves the area immediately underneath the electrode, that we may term the area of entry into the body.

The current density decreases depending upon the size of the electrode as compared to the possible area through which the current may pass. It is a well known electrical law that the heat generated by a current decreases as the square of the density of the current per cubic centimeter. In other words, if the current is going to decrease very rapidly in density as it leaves the area of entry into the body and the temperature generated decreases as the square of the density per cubic centimeter, then it is very apparent that the amount of temperature rise generated to any depth with pad electrodes that are comparatively greatly less in size that the cross section of the part we are trying to treat is practically nil, considering circulation and other effects.

When "cuff" electrodes are used where the area of the cuff electrode is considerably larger than the cross section of the part being treated, thereby causing the port of entry of the current into the body to be such that the current enters the body at a low density and then passes from one cuff electrode to the other through the part of the body where the cross section was less than the area of either cuff, a very substantial rise in temperature is produced deep in the tissues. In fact, by having the cuffs sufficiently large and sufficiently far apart any area may be heated to almost any desired temperature within physiological limits. The point is that cuff electrode must be considerably larger than the cross section of the part being treated, thereby allowing the current to enter the patient's body at as low a density as possible, in order to remain well below tolerance at that point; then have cuff electrodes as far apart as is convenient (the farther apart the more heat generated).

Due to the fact that where electrodes are of smaller area, thereby causing the port of entry of the current to be smaller in area than the cross section of the part you are trying to heat up, and resultingly giving a high surface temperature with very little heat in the depth, it will be found that there is practically no relationship between the patient's sensation of heat and the actual rise in temperature of the part being treated. With small pad electrodes the patient can be given a tremendous sensation of heat and practically no rise in the depth of the part being treated, whereas by using cuff electrodes,

giving a large area through which to have the current enter the patient's body, the heating will stay well within the comfortable tolerance of the patient and yet a very substantial rise in temperature in the parts being treated generated.

As it appears to be the opinion of the best informed men that the therapeutic value of the application of short wave is somewhat in proportion to the rise in temperature of the parts being treated, insofar as it is kept within the comfortable tolerance of the patient and within approximately 104 or 105 degrees in the depth of the tissues, it does appear that with cuff electrodes the therapeutic benefits should be vastly increased. It further appears that with small pad electrodes, where the heat is so patently immediately underneath the electorde, with very little penetration, while the apparent benefits we have received have not been entirely psychological, yet they must have been very small in therapeutic effect as compared to what might have been accomplished were the parts actually heated up to the point where there was a very perceptible temperature rise yet the application still being kept well within the tolerance of the patient.

An interesting experiment is to use the usual pad electrodes, front and back, give the patient all the current he can tolerate for, say, 20 minutes, and see how much actual rise in temperature can be given in the rectum or the vagina. Conduct the same experiment but place large cuff electrode, size 9" x 48" around the patient's abdomen and a large cuff electrode, size 12" x 40" around both thighs (legs together). Give the maximum amount of current that can be tolerated in both instances for the same period of time and you will note with the large cuff electrodes a great deal more rise in temperature is produced. On any and all parts that are susceptible to treatment with cuffs you can get a great deal greater rise in actual temperature by employing them. It is our recommendation that cuffs be used whenever possible.

Always bind the condenser pad or cuff electrodes snugly in place to maintain a uniform contact and thus avoid variation of heat production during the treatment. The current of the patient's circuit is tuned to the capacity of that particular circuit or application, and if the electrodes are placed loosely the capacity and heat production will vary with every movement of the electrodes.

Always keep connecting cords on electrodes well separated and at rest while treating. Tangled cords give a false amperage reading and swinging cords cause a fluctuation and variation of heat production. Do not have connecting cords in contact with patient or any material that would conduct those currents from cord to cord instead of through the patient. METAL CHAIRS AND TABLES MUST BE AVOIDED.

PATIENT'S CONTROL

The patient's control is a vernier control, operating in conjunction with the five-point volume control. Together, these two controls assure the continual increase of current to patient from zero to maximum, or a like decrease. In a word, current to the patient can be applied at any volume from zero to maximum.

FIVE-POINT VOLUME CONTROL

This control is placed in the primary circuit. It is unique in the FISCHER design. It works in combination with the patient's control in the secondary circuit, providing five major levels of current to patient, from zero to maximum.

Do not attempt to plug electrode cords into the outlets on the machine with the filament and plate current switches on.

With the electrodes applied, proceed as follows:

(1) See that the machine is connected to alternating current of 60 cycles, of from 105 to 120 volts.

(2) Set "Power Control" on point 1 - 2 - 3 - 4 or 5 depending on volume of heat desired.

(3) Turn on filament current switch, wait few seconds.

(4) Then throw plate current switch.

Now turn the "Patient's Control" slowly to increase or decrease current as desired. Meter needle movement will indicate which way to turn control. When meter needle reaches highest point and begins to reverse - you have reached the point of greatest output for the size of electrodes, the amount of padding used and the position of the electrodes in respect to one another. When the heat at this point is excessive - either turn "Patient's Control" in either direction or cut down on primary current with "Volume Control".

Should reading on milliampere meter continue to rise as the "Patient's Control" is moved over the entire range, without reaching the above described "highest" point, this indicates a change in padding is necessary. If in turning this control from right to left the needle continues to rise and does not reverse when zero position is reached more padding is necessary. If the heat at this point is insufficient with the additional padding the indication is that the electrode is too large - requiring still more padding. (Increasing padding is the equivalent of reducing the size of the electrode but more padding is preferable because of its more uniform heating). This experience will take place when using large electrodes. With very small electrodes the reverse may occur. The needle will rise as the "Patient's Control" is moved from zero to maximum without reversing, indicating too much padding or that the electrodes are too small. When in doubt as to the setting of the "Patient's Control" when beginning a treatment and to avoid undue momentary heating before making adjustment, it is safer to have used too much padding underneath the electrode than too little, and to be sure to start the treatment with the "Volume Control" on a low setting.

PATIENT'S CURRENT OUTLETS

On the Fischer short wave machines are four patient's terminals, providing a selection of three potentials (voltages). It is possible, with this arrangement to properly employ any size condenser electrodes, from the smallest to the largest, plate or cuff types.

In the following suggested technics, certain combinations of outlets 1 and 2, 1 and 4, and 3 and 4 are mentioned. It will be found that the smaller electrodes will work best when connected to outlets 3 and 4 - that medium sized electrodes will function best when connected to outlets 1 and 4 - and that the largest pads and cuff electrodes give best results with terminals 1 and 2.

CAUTION:

Heat generation from Short Wave currents begins gradually and accumulates. It takes a moment or so before the patient begins to feel what might be

Called nice comfortable warmth and that is what is wanted for reconstructive treatment. Too much current develops heat too fast and the skin may get too hot resulting in hot spots, blisters, burns, a dull ache, and demands close supervision. Never disregard a patient's complaint of "too hot". To make a demonstration of quick heat production, you may turn on all the heat the unit can generate for just a minute or two but for successful treatment purposes follow the conservative directions given above.

TREATMENT SUGGESTIONS

LIMBS

A Turkish towel or Terry cloth is folded and wrapped around the limb, below and above the area to be heated; a cuff type electrode of sufficient length to make a complete circle is then placed over this toweling and bound in place. Connect electrodes to patient's outlets Nos. 1 and 4. It is not always possible to select an electrode of just such length that will make a complete circle around the limb but overlapping will do no harm - or should electrode be a trifle short of a complete circle there will be very little difference in the heating effect. Simply select cuff electrode most adaptable.

Or place active electrode 5½" x 8½" (with some toweling between) on soles of feet. If patient is sitting, the feet are merely placed on the electrodes - if reclining, pads must be bound in place. A large indifferent pad electrode is placed at the patient's back. If patient is reclining, it is best to place this electrode on the abdomen with a folded Turkish towel under it, securely binding it in place. Use patient's outlets Nos. 1 and 4.

Such applications are more or less a matter of experiment and without such experimentation it will be impossible for any operator to ascertain the full value of the Short Wave Apparatus.

SHOULDER

Wrap a towel around the arm above the elbow, and around it a cuff electrode of sufficient length to make a circle. The other (medium sized plate) electrode is placed over a folded towel on the top of the shoulder, well over to the neck. (outlets 1 and 4).

To heat both upper arms and shoulder place cuffs (over towels) around both upper arms. (outlets 1 and 4).

Or a large plate or pad electrode is placed under the patient's back (with towel between), and several inches of insulating padding is placed on the abdomen. Upon this place a 5½" x 8½" pad electrode. The patient places both hands on this pad and maintains contact with the palms. A towel between the hands and this electrode, and wrapped about the hands and arms helps to confine the heat. (outlets 1 and 4).

BRONCHIA (Upper lung area)

Place 5½" x 8½" condenser pad electrode parallel to sternum with some toweling between it and patient. Bind on securely. Have patient sit with back against (or lie upon) a large indifferent electrode. (outlets 1 and 4).

GALL BLADDER

Place 5½" x 8½" condenser pad electrodes upon right side of abdomen on a line with the lower rib and extending from navel to the right - have towels between it and patient. Bind this electrode snugly in place. Place largest electrode on patient's back. (outlets 1 and 4).

FRONTAL SINUS

Place 2" x 4½" condenser pad electrode on two layers of heavy toweling on forehead, lower edge on line with eyebrow. Bind snugly with bandage passed around the head, anterior - posterior. Have patient sit on or place large electrode on back. (outlets 1 and 4 or 3 and 4).

FINGERS - HAND OR WRIST

Have patient sit on large pad electrode. Place three or four inches of padding on patient's lap with medium sized pad electrode on top, place finger or fingers in contact with this; in this manner the heat can be concentrated to the very finger tips by just contacting tips, by contacting more of the fingers' area the heat will be farther up to include hand or wrist. Covering the part with a towel will confine the heat. (outlets 1 and 4).

NECK (Anterior)

Place medium sized pad electrode over two layers of toweling on throat (anterior). Have patient lie on or sit with their back against the large electrode - toweling between it and patient. Be sure there is no metal in contact with patient electrodes and patient. Bind electrodes on snugly. (outlets 3 and 4).

NECK (Posterior)

Place medium sized pad electrode over a couple of layers of toweling on back of neck. Place 5½" x 8½" condenser pad electrode on about four layers of toweling on chest. The above will result in deep heat; for less depth use the large electrode as indifferent, toweling between it and patient. Be sure there is no metal in contact to patient between electrodes and patient. Bind electrodes on snugly. (outlets 3 and 4).

EAR (one only)

Place medium sized pad electrode on about four layers of heavy padding touching on side of ear from base of skull to cheek over ear to be treated. Bind this in place with bandage by passing bandage under chin and over head twice and around back of and under base of skull and over ear a couple of turns holding both ends of this electrode snugly in place. Place large pad electrode on opposite side of body under treatment, preferably under arm. Pad between arm and pad to keep arm from contacting this electrode. (outlets 1 and 4).

EAR (both)

Place a medium sized pad electrode over four layers of Turkish toweling or equal, on each side of the head from base of skull to cheek. A towel may be folded into a narrow strip, four thick, and passed across back of the head and over the ears with the electrodes placed on over this, then the whole is bound in place with bandage, passed under the chin and over the head twice then around

back of and under base of skull a couple of times until snugly bound in place. (outlets 3 and 4).

Fever Therapy (Hyperpyrexia)

The patient, with all clothing removed, is placed on a bed on which are not less than three woolen blankets, over a rubber sheet. Heavy Turkish toweling (or Terry cloth) is wrapped around both thighs (legs together, one electrode only). Over this is placed a 12" x 40" cuff type electrode, held snugly in place by bandage, but not too tight to cause cramping or other discomfort.

Similar toweling, and an electrode of 9" x 48" is placed around the abdomen. (outlets 1 and 2).

The patient is then wrapped in the woolen blankets and in turn covered with the rubber sheet. There should be two or more thicknesses of blankets over the patient. "Volume Control" switch on point 4 or 5. Current is turned on and tuned in to the maximum amperage reading. If the patient complains of too much heat it will be necessary to reduce the current by setting "Volume Control" switch down, or cut down by patient control. When the temperature of the patient is rising and has arrived at a point about 1 degree below the maximum desired, it is advisable to turn off the current as the temperature will continue to rise fully 1 degree without additional treatment. If the patient is thoroughly insulated with the blankets, the temperature will be maintained for considerable time after the current has been turned off.

(Electrocoagulation)

A foot switch outlet is located on the right hand side of cabinet. It is connected in parallel with plate current switch and naturally that switch should be left off when using the foot switch. Select either pointed or ball applicator as the active electrode, which is held in insulated handle and connect to the patient's outlet (outlet #1 or #2). Some experimenting will be required at first to determine amounts of coagulation at various settings. It will be found that no indifferent electrode is required for Electrocoagulation. The patient's body provides sufficient capacity, and the point or ball alone with just one cord and handle will work very nicely. Or the indifferent electrode (connected to 1 or 2) may be placed on the floor near base of machine. If coagulation is too slow, set "Volume Control" up to a higher point. If coagulation is too fast, set "Volume Control" down to 1 or 2.

To Obtain Electrosurgical Tissue-Cutting Current

Have the patient in contact with one of the large condenser electrodes which in turn is connected to patient's outlets (outlet #1) on the panel. Any of the cutting devices shown on page 11 of the Fischer Accessories Catalog (No. 30) may now be used, by setting them into proper insulated handle which in turn is connected to patient's outlet (outlet #2) on the panel. Cutting current may be increased or decreased by changing settings of "Patient's Control".

A clean incision with little or no side wall dehydration is obtained from practically the same settings of the machine controls as a cut with much side wall dehydration. The speed of the moving blade controls this factor to a great degree. The faster the blade is moved the cleaner the cut, and contrarily if the blade is moved slowly through the tissues dehydration will rsult.

It will be found in many instances that no indifferent electrode is required for tissue-cutting. The patient's body provides sufficient capacity, and the blade alone with one cord will work very nicely. Or have the patient sit or lie upon a large condenser pad as the indifferent electrode. This pad is placed to suit the patient's convenience; or the indifferent electrode may be placed on the floor near base of machine. When cutting, turn current on in patient's circuit, with foot switch, before contacting patient with active electrode. If cutting is too slow, set "Volume Control" up to a higher point. If cutting is too fast, set "Volume Control" down to 1 or 2.

CAUTION:

DO NOT HAVE PATIENT SITTING ON METAL CHAIR OR LYING ON METAL TABLE WHEN USING EITHER CUTTING OR COAGULATING CURRENTS FROM SHORT WAVE APPARATUS.

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Form 1564A
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